Special Session Proposal for IEEE WCCI 2010

Related conference(s): IEEE CEC 2010

Special session title: Bio-Inspired Self-Organizing Multi-Agent Systems

Objectives:

Self-organizing multi-agent systems are supposed to be able to act without external control to accomplish complex tasks, while adapting to changing environmental conditions. In other words, we expect them to exhibit some life-like features, such as self-reconfiguration, self-repair, self-reproduction, and context awareness. However, developing such distributed self-organizing systems, where desired global behaviors can emerge through contextual local interactions among individual agents as well as between the agents and the environment, is a very challenging task.

Biological systems, from macroscopic swarm systems of social insects to microscopic cellular systems, can generate robust and complex emerging global behaviors through relatively simple local interactions in the presence of various kinds of uncertainty. Borrowing ideas from biological systems for developing self-organizing multi-agent systems has become increasingly popular. For example, swarm intelligence, a novel paradigm for solving complex problems with massively parallel systems, has been inspired by behaviors observed in social insect colonies, flocks of birds, etc. Another example is that of artificial embryogeny, which simulates the process of embryonic development of biological organisms. Artificial embryogeny techniques have been applied in the construction of self-organizing and self-assembling robotic systems.

This special session aims to bring together new theories and methodologies inspired by biological principles for self-organizing multi-agent systems. The emphasis of the session is on bridging multi-disciplinary research areas such as multi-agent systems, robotics, artificial life, and evolutionary computation.

Topics of interest:

The topics explored in this special session include, but are not limited to:

- Genetic and cellular approaches to self-organization and self-assembly
- Morphogenesis in multi-agent systems
- Self-reconfiguration and self-assembly in modular robots
- Self-organized and self-repairing multi-agent pattern formation
- Multi-agent flocking and consensus
- Self-organized collective construction and stigmergy
- Swarm intelligence based approaches to multi-agent systems
- Distributed task allocation in multi-agent systems
- Robustness, sensitivity, and evolvability of self-organizing multi-agent systems

- Real world applications, e.g., cognitive network management, coverage, self-assembly of nanostructures, smart materials, swarm robotics, reconfigurable modular robots, and traffic control

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